

REMARKS

The various parts of the Office Action (and other matters, if any) are discussed below under appropriate headings.

1. Claim Amendments

Independent claim 1 has been amended to recite an embodiment that provides a polyphonic ring signal. Claim 1 has also been amended to clarify that the out-of-band harmonics increase the perceived sound pressure level of the polyphonic ring signal and thereby improve the alert function of the ring signal. Support for these amendments can be found in the specification at, for example, page 1, lines 25–26 and page 3, lines 23–26.

Claims 8–10 have been canceled. Minor amendments have been made to claims 5, 13, and 14 for clarity purposes.

Accordingly, Applicant respectfully requests favorable reconsideration of the amended claims.

2. Claim Rejections - 35 U.S.C. § 103

Claims 1, 10, and 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 3,828,133 to Ishigami in view of U.S. Patent No. 4,853,963 to Bloy. Applicant respectfully requests withdrawal of this rejection for at least the following reasons.

Independent claim 1, as amended, recites a device for increasing the perceived bandwidth in an audio signal path with limited bandwidth. The claimed device includes, *inter alia*, a harmonic generator for producing out-of-band harmonics of a polyphonic ring signal. Claim 1 further recites a combiner for adding the out-of-band harmonics to a first part of the polyphonic ring signal. As claimed, the out-of-band harmonics increase the perceived sound pressure level of the polyphonic ring signal and thereby improve the alert function of the ring signal.

One advantage of the claimed invention is that while the actual signal bandwidth stays the same, the addition of out-of-band harmonics provides a polyphonic

ring signal that is perceived as having a wider frequency range and a more full-bodied expression. As mentioned in the instant specification, the sound generators in mobile telephones typically restrict the audio bandwidth to 3.4kHz. However, limiting polyphonic ring signals to 3.4 kHz creates a dull sonic expression, like AM radio. Also, polyphonic ringers with limited bandwidth sound weaker, making it harder for a user to hear when the phone is ringing. A ring signal is only useful if it can attract the attention of the user. The claimed invention adds high frequency content in the form of out-of-band harmonics to a polyphonic ring signal in order to provide an improved alert function. For example, by adding harmonics in the range of 5 kHz, the polyphonic ringer remains clearly noticeable, even in noisy situations.

The Examiner now asserts that in light of Ishigami and Bloy it would have been obvious to try adding out-of-band harmonics to an audio signal in order to restore voice character and increase intelligibility. However, even if the Examiner is correct, Applicant respectfully submits that for at least the reasons below, a person of ordinary skill in the art looking at the cited references at the time of the invention would not have attempted to add out-of-band harmonics to a polyphonic ring signal in order to provide an improved alert function.

As recognized by the Examiner, neither Ishigami nor Bloy disclose adding out-of-band harmonics to a polyphonic ring signal. Both Ishigami and Bloy are directed to improving speech quality in voice signals and are not concerned with ring signals. Ishigami is directed to providing a low frequency, band-limited voice signal with "high speech quality not less than the speech quality of an ordinary telephone circuit" (col. 1, lns. 37–40; col. 2, lns. 19–43). Ishigami adds higher harmonics to the degraded signal to approximate the original voice signal. But Ishigami makes no mention of out-of-band harmonics. Bloy mentions that the reconstitution of out-of-band harmonics that would otherwise be attenuated by a narrow pass band permits the realization of a normal voice character, and thereby increases intelligibility of the voice signal. However, Bloy makes no mention of adding out-of-band harmonics to a voice signal, let alone a polyphonic ring signal.

Not only do Ishigami and Bloy fail to disclose the claimed invention, but also, a

skilled person looking at the cited references would have been led down a path divergent from the claimed invention. As explained in the instant specification, higher order harmonics should be added to a polyphonic ring signal than to a voice signal (see, e.g., pg. 3, Ins. 9–18). This is because the added harmonics should provide a suitable addition to the initial bandwidth, and what is “suitable” differs for voice signals and ring signals. When adding harmonics to a voice signal, the goal is to preserve or recreate the original voice signal as much as possible, as described in both Ishigami and Bloy. However, if the same level of harmonics were added to a polyphonic ring signal, the resulting ring signal would sound more natural (like the ringer in Mousty discussed below), rather than providing an improved alert function like the claimed polyphonic ring signal.

Applicant recognized that a ringer needs high frequency content in order to attract the attention of the user, especially in noisy situations. Thus, the claimed invention adds higher order out-of-band harmonics to a polyphonic ring signal in order to increase the perceived sound pressure level and thereby provide an improved alert function. The cited references have no appreciation of the need to provide an improved alert function. Furthermore, if the claimed high-level harmonics were added to a voice signal, the resulting voice signal would sound synthetic or shrill. Thus, a skilled person looking at Ishigami and/or Bloy would not have arrived at the claimed invention.

Since both Ishigami and Bloy fail to disclose a ring signal, the Examiner adds U.S. Patent Application Publication No. 2001/0034252 to Mousty as teaching a ring signal to which harmonic enhancements may be applied. Also, the Examiner states that a polyphonic ring signal is known in the art. Even if the Examiner's statements are correct, the proposed combination of Ishigami, Bloy, and Mousty does not disclose or make obvious the claimed invention for at least the reasons below.

Unlike the claimed invention, Mousty discloses adding in-band harmonics to a fundamental ring signal in order to produce a richer sound. In fact, Mousty specifically states that its “device makes it possible to generate melodies of a quasi-natural sound quality close to that produced by musical instruments and therefore far more pleasant to the ear of the user than produced by conventional ringing devices, for example by

portable telephones currently available on the market” (page 3, paragraph 57). A pleasant sounding ringer that approximates real musical instruments does not contain the high frequency content required to attract the attention of the user in even the noisiest of situations. Thus, even if Mousty were combined with Ishigami and Bloy, the claimed invention would not result.

Furthermore, Mousty has no appreciation of the need for a ringer that attracts the attention of a user. Instead, the Mousty disclosure focuses on generating pleasant, quasi-natural sounding melodies. In contrast, the claimed invention adds out-of-band harmonics that increase the perceived sound pressure level of a polyphonic ring signal. Accordingly, a skilled artisan looking to improve the alert function of a polyphonic ringer would not turn to Mousty.

In sum, none of the references cited by the Examiner disclose or make obvious adding out-of-band harmonics that increase the perceived sound pressure level of the polyphonic ring signal and thereby improve the alert function of the ringer.

For at least the reasons stated above, claim 1 and all claims depending from claim 1 recite patentable subject matter.

Claims 2, 3, 4, 6, and 7 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishigami in view of Bloy, in further view of U.S. Patent No. 5,923,766 to Oda and in further in view of U.S. Patent No. 5,828,755 to Feremans. Withdrawal of this rejection for at least the following reasons is respectfully requested.

Oda is directed to an audio conversion circuit that compensates for low frequency audio components that are lower than the frequency a speaker can reproduce and are supplied to a speaker having poor low frequency response. Oda discloses the low frequency component of an input audio signal being filtered and extracted to generate even numbered harmonics. Secondary harmonics are extracted from these even numbered harmonics, amplified to an appropriate level, and then added to the original input signal.

Feremans discloses a method for improving and/or altering the quality of audio signals by isolating a number of signals from the input signals, generating higher harmonics of those isolated signals, amplifying the higher harmonics, and then

combining the higher harmonics with either the original signal or a treated version of the original signal.

Claims 2, 3, 4, 6, and 7 depend from claim 1. Neither Oda nor Feremans makes up for the above-described deficiencies of the proposed combination of references. Therefore, claims 2, 3, 4, 6, and 7 are allowable for at least the reasons set forth above.

Claim 5 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishigami in view of Bloy, in further view of Oda and in further in view of U.S. Patent No. 6,865,430 to Runton. Withdrawal of this rejection for at least the following reasons is respectfully requested.

Runton is directed to an apparatus that may be provided in software as instructions to a digital signal processor for enhancing digital audio signals after compression and decompression. Runton discloses receiving a digital decompressed audio signal and splitting the signal into two parts. One part of the signal is harmonically enhanced and the other part has warmth added to it. Both parts of the signal are then combined and frequency equalized to provide the digitally enhanced output signal.

Claim 5 depends from claim 1. Runton does not make up for the above-described deficiencies of the proposed combination of references. Therefore, claim 5 is allowable for at least the reasons set forth above.

Claim 11 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishigami in view of Bloy and in further view of U.S. Patent No. 6,606,388 to Townsend. Withdrawal of this rejection for at least the following reasons is respectfully requested.

Townsend is directed to a technique for enhancing audio signals generated from compressed digital audio files. The first two processing modules create harmonic sequences from the low frequency components and then the high frequency components contained in the original input signals. A third processing module adds and subtracts delayed and filtered versions of the enhanced input signal with itself to create left and right channeled stereo-like outputs.

Claim 11 depends from claim 1. Townsend does not make up for the above-described deficiencies of the proposed combination of references. Therefore, claim 11

is considered allowable for at least the reasons set forth above.

Claims 13 and 14 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishigami in view of Bloy and in further view of Mousty. Withdrawal of this rejection for at least the following reasons is respectfully requested.

Claims 13 and 14 depend from claim 1. As discussed above, Mousty does not make up for the above-described deficiencies in the proposed combination of references. Therefore, claims 13 and 14 are allowable for at least the reasons set forth above.

Accordingly, reconsideration and withdrawal of all rejections under 35 U.S.C. § 103(a) is respectfully requested.

3. Conclusion

In light of the foregoing, it is respectfully submitted that the present application is in condition for allowance and notice to that effect is hereby requested. If it is determined that the application is not in condition for allowance, the Examiner is invited to initiate a telephone interview with the undersigned representative to expedite prosecution of the present application.

If there are any fees resulting from this communication, please charge same to our Deposit Account No. 18-0988, our Order No. SALBP0127US.

Respectfully submitted,

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U.S. Patent and Trademark Office to the Attention of **Examiner Faulk**.

/Warren A. Sklar/
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September 16, 2008
Date